It is claimed:

1. A method for separating a mixture of ions in a sample employing a microfluidic device comprising a microchannel having a neutral nonbornene based polymer surface and two electrodes for creating an electrical field in said microchannel, said method comprising:

introducing said sample into said microchannel comprising an aqueous dispersion of a sieving polymer under the electrical influence of said field, whereby ions in said sample migrate in said aqueous dispersion to separate into fractions.

2. A method according to Claim 1, wherein said ions are nucleic acid ions.

3. A method according to Claim 1, wherein said sieving polymer is an acrylamide.

4. A method according to Claim 1, wherein said norbornene based polymer is a hydrocarbon copolymer.

5. A method according to Claim 1, wherein said hydrocarbon copolymer is a copolymer of norbornene derivatives.

6. A method of sequencing a nucleic acid, wherein target DNA is copied to produce a sample mixture plurality of differently sized labeled fragments complementary to sequences of said nucleic acid sample, employing a microfluidic device comprising a microchannel having a neutral nonbornene based polymer surface and two electrodes for creating an electrical field in said microchannel, said method comprising:

introducing said sample mixture into said microchannel comprising a sieving polymer under the influence of said electrical field, whereby said differently sized labeled fragments are separated by size; and

detecting said differently sized labeled fragments to determine the sequence of said target DNA.

7. A method according to Claim 6, wherein said sieving polymer is linear polyacrylamide.

8. A method according to Claim 6, wherein said fragments are produced by the polymerase chain reaction using at least one labeled terminating nucleotide.

9. A microfluidic device comprising a microchannel having a cross-section in the range of about 100 to 40,000μm^2 and a surface comprising a hydrocarbon norbornene based polymer.

10. A microfluidic device according to Claim 9, wherein said norbornene based polymer is a copolymer.

11. A microfluidic device according to Claim 9, wherein said microchannel comprises an aqueous dispersion of a sieving polymer.

12. A microfluidic device according to Claim 11, wherein said sieving polymer is a linear polyacrylamide.

13. A microfluidic device comprising three layers of norbornene based polymer, a first outer layer comprising microchannel and reservoir features, a second intermediate layer, and a third outer layer enclosing one side of said features, wherein said second intermediate layer has a lower glass transition temperature than said first and third outer layers.

14. A microfluidic device according to Claim 13, wherein said norbornene based polymer is a copolymer.

15. A microfluidic device according to Claim 13, wherein said microchannel comprises an aqueous dispersion of a sieving polymer.

16. A microfluidic device according to Claim 15, wherein said sieving polymer is a linear polyacrylamide.

17. A microfluidic device comprising a norbornene polymer based solid substrate having a surface area of at least about $1cm^2$ and not more than about $200cm^2$, having at least one microfluidic unit comprising at least two connected channels and at least three reservoirs, said channels having a cross-sectional area in the range of about 100 to $40,000\mu m^2$, and a norbornene polymer based cover layer enclosing at least said microchannels.

18. A microfluidic device according to Claim 17, wherein said cover layer is bonded to said substrate by a norbornene polymer based layer having a glass transition temperature at least about 20°C lower than the glass transition temperature of said substrate.

19. A microfluidic device according to Claim 17 comprising a sieving polymer in at least one of said channels.